

WHAT IS CLAIMED IS

1. A method of manufacturing a semiconductor device,  
comprising the steps of:

- 5           forming a gate oxide film on a substrate;  
          forming gate interconnections on the gate oxide film, each  
          gate interconnection including a first silicon film and a dielectric  
          film;  
10           forming a first diffusion layer by means of implanting an  
          impurity into the substrate while the gate interconnections are taken  
          as a mask;  
          forming a second silicon film over the entire surface of the  
          substrate so as to cover the gate interconnections, after formation  
          of the first diffusion layer;  
15           thermally-oxidizing the second silicon film, thereby forming  
          a thermal oxide film; and  
          forming an interlayer dielectric film on the thermal oxide  
          film.

20           2. The method of manufacturing a semiconductor device according  
          to claim 1, wherein each of the gate interconnections includes a  
          silicide film interposed between the first silicon film and the  
          dielectric film.

25           3. The method of manufacturing a semiconductor device according  
          to claim 1, wherein the first silicon film is a doped silicon film,  
          and  
          the second silicon film is formed at a temperature higher than  
          700°C.

30           4. The method of manufacturing a semiconductor device according  
          to claim 1, wherein the second silicon film is a doped silicon film.

5. The method of manufacturing a semiconductor device according to claim 1, further comprising a step of forming, after formation of the thermal oxide film and prior to formation of the interlayer dielectric film, a second diffusion layer which is higher in impurity concentration than the first diffusion layer, by means of implanting an impurity into the substrate while the thermal oxide film is taken as a mask.

6. A method of manufacturing a semiconductor device, comprising
- 10 the steps of:
- forming a gate oxide film on a substrate;
- forming gate interconnections on the gate oxide film, each gate interconnection including a first silicon film and a dielectric film;
- 15 forming a first diffusion layer by means of implanting an impurity into the substrate while the gate interconnections are taken as a mask;
- forming, after formation of the first diffusion layer, a second silicon film over the side surfaces of the first silicon film;
- 20 thermally-oxidizing the second silicon film, thereby forming a thermal oxide film; and
- forming, after formation of the thermal oxide film, an interlayer dielectric film over the entire surface of the substrate so as to cover the gate interconnections.

25

7. The method of manufacturing a semiconductor device according to claim 6, wherein each of the gate interconnections includes a silicide film interposed between the first silicon film and the dielectric film, and
- 30 the second silicon film covers side surfaces of the first silicon film and those of the silicide.

8. The method of manufacturing a semiconductor device according

to claim 6, wherein the first silicon film is a doped silicon film,  
and

the second silicon film is formed at a temperature higher than  
700°C.

5

9. The method of manufacturing a semiconductor device according  
to claim 6, wherein the second silicon film is a doped silicon film.

10. The method of manufacturing a semiconductor device  
according to claim 6, further comprising a step of forming, after  
formation of the thermal oxide film and prior to formation of the  
interlayer dielectric film, a second diffusion layer which is higher  
in impurity concentration than the first diffusion layer, by means  
of implanting an impurity into the substrate while the thermal oxide  
film is taken as a mask.

15

11. The method of manufacturing a semiconductor device  
according to claim 6, wherein in the step of thermally-oxidizing the  
second silicon film, the surface of the second silicon film is  
thermally-oxidized, thereby forming a layer of thermal oxide film  
and leaving a second silicon film between the layer of the thermal  
oxide film and the gate interconnections.

20

12. The method of manufacturing a semiconductor device  
according to claim 11, wherein one-third to two-thirds of the second  
silicon film is thermally oxidized, thereby forming the layer of the  
thermal oxide film.

25

13. The method of manufacturing a semiconductor device  
according to claim 1, wherein the second silicon film is thermally  
oxidized at a temperature of 700 to 1200°C.

30

14. The method of manufacturing a semiconductor device

according to claim 6, wherein the second silicon film is thermally oxidized at a temperature of 700 to 1200°C.

15. A semiconductor device comprising:  
5 a substrate;  
a gate oxide film formed on said substrate;  
a plurality of gate interconnections which are formed on said gate oxide film, each of said gate interconnections including a first silicon film and a dielectric film;  
10 an impurity diffusion layer formed in said substrate between said gate interconnections;  
a thermal oxide film covering each of said gate electrodes;  
and  
an interlayer dielectric film formed on said thermal oxide  
15 film;  
wherein a side surface of the dielectric film and a side surface of the first silicon film constitute a single plane.

16. The semiconductor device according to claim 15, wherein  
20 each of the gate interconnections includes a silicide film interposed between the first silicon film and the dielectric film, and  
a side surface of the dielectric film, a side surface of the first silicon film and a side surface of the silicide film constitute a single plane.

17. The semiconductor device according to claim 16, wherein  
25 said thermal oxide film covers only a side surface of the first silicon film constituting said gate interconnection and a side surface of the silicide film.

18. The semiconductor device according to claim 15, wherein  
30 said thermal oxide film covering the side surface of each of said gate interconnections has a uniform thickness.

19. The semiconductor device according to claim 16, wherein  
said thermal oxide film covering the side surface of the silicide  
film is thicker than said thermal oxide film covering the side surface  
5 of the first silicon film.

20. The semiconductor device according to claim 15, further  
comprising a second silicon film disposed between the side surface  
of said gate interconnection and the side surface of said thermal  
10 oxide film.